HERRING FISHERY OF THE U. S. PASSAMAQUODDY REGION

by Leslie W. Scattergood and Lewis J. Lozier

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by

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ABSTRACT

The Maine herring fishery during 1947-58 has averaged 148 million pounds and has ranged from 75 to 200 million pounds. Catches in the Passamaquoddy Project area have averaged over 6 million pounds and have ranged from 2 to almost 11 million pounds. Maine herring landings immediately outside the dams averaged 6 million pounds and in the remainder of Washington County 28 million pounds. Yearly catch fluctuations in the Project area fisheries are great, for example, the low pool fishery caught 49,000 pounds in 1947 and over 6 million pounds in 1954. The Maine herring fishery is seasonal; most of the catch occurs between June and October. In the two pools, most of the herring have been caught between August and October. Along the entire Maine coast, stop seines have been the most productive gear; in the Project area, seiners took 77 percent of the low pool catch, but only 17 percent of the high pool catch. Since 1947, the number of weirs fluctuated markedly, from none to 16 in the low pool and 14 to 31 in the high pool.

INTRODUCTION

The Governments of Canada and the United States asked the International Joint Commission to determine the feasibility, desirability, and cost of constructing a hydroelectric power plant in Passamaquoddy and Cobscook Bays. This electricity-producing project has two proposed impoundments, the high and low pools. Turbines in the power plant would be activated by the flow of sea water, controlled and guided through the two huge pools by a system of dams with filling or emptying gates.

The International Passamaquoddy Fisheries Board was created by the International Joint Commission and was charged with the responsibility for determining the effects that this proposed tidal power project might have on the fishery economics of the United States and Canada. Accordingly, Canadian and United States scientists studied the oceanographic, biologic, and fishery economic characteristics of the "Quoddy Region" to provide a basis for assessing the economic impact of the proposed project.

The Quoddy Region is shown in figure 1. The high pool includes the western sides of the St. Croix River estuary and Passamaquoddy Bay, together with the shores and waters of the east side of Moose Island. The low pool consists

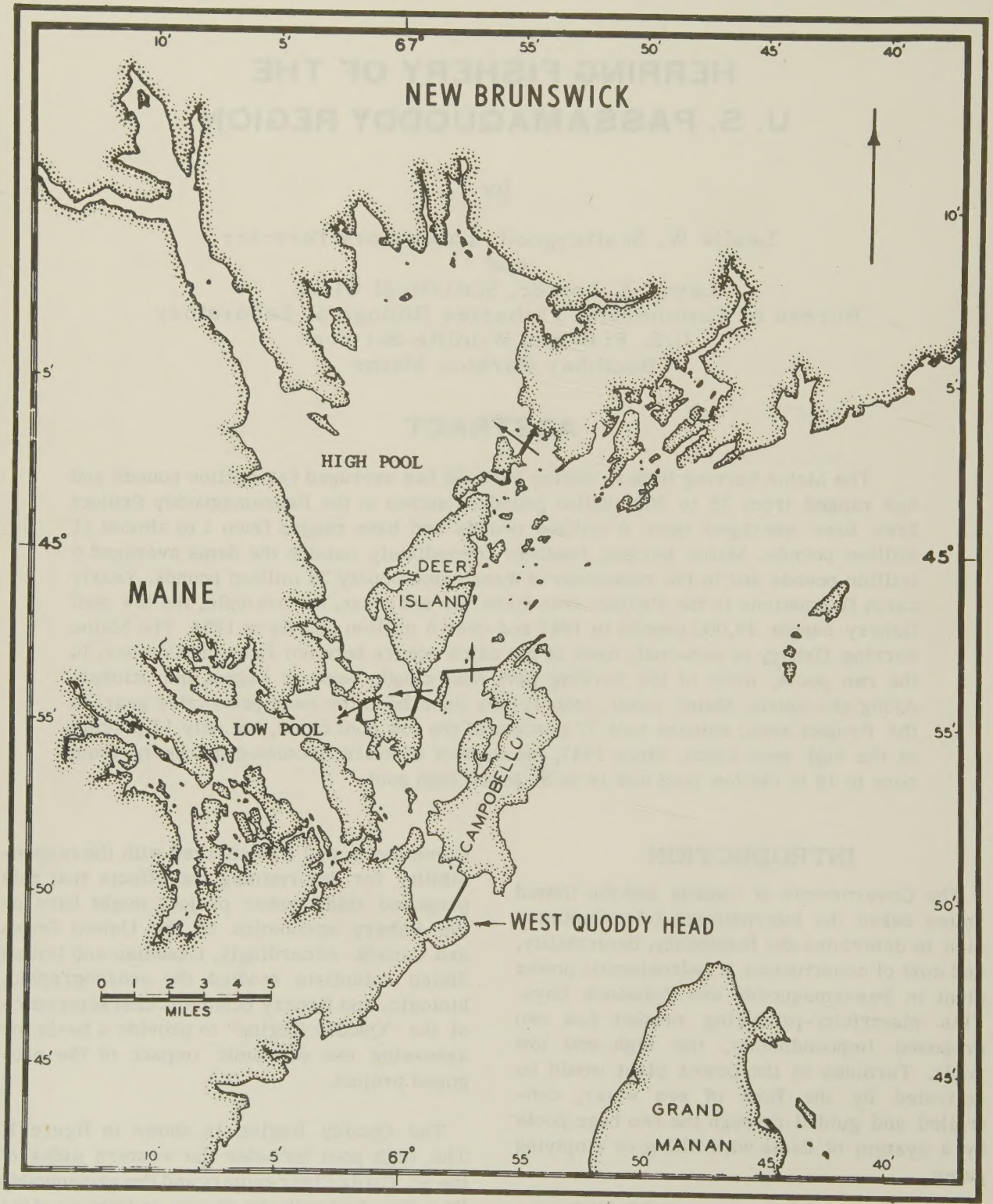


Figure 1.--Chart of the Passamaquoddy Project area. Arrows indicate the flow of water.

of Cobscook Bay and the shores and waters to West Quoddy Head.

MATERIAL AND METHODS

The herring statistics presented here have been collected under a system that began in 1947 (Scattergood, 1949). At that time the Maine Sardine Packers Association, Maine Department of Sea and Shore Fisheries, and the U.S. Fish and Wildlife Service began a cooperative sardine herring investigation, under the direction of the Federal agency. Daily records of herring landed at sardine canneries are obtained by the fish inspectors of the Maine Department of Agriculture. Each landing record has the fisherman's name, quantity of sardine caught, date and locality of capture, gear used, and the cannery's name. The data are put on Keysort cards that are forwarded to the Maine Department of Sea and Shore Fisheries' office where the information is used by statistical agents in the preparation of the monthly Maine fish landings reports. The cards are then given to the scientific personnel of the Federal biological laboratory in Boothbay Harbor. Federal and State statistical agents collect similar data from fish meal plants, pearl essence producers, herring smokers, herring picklers, and cat food canners.

HISTORY OF FISHERY

It is probable that herring fisheries existed in the Passamaquoddy Region prior to the first visits of European fishermen four and a half centuries ago. Indians utilized weirs to capture fish, and herring are readily taken in such gear. Historical information on both the aboriginal and early colonial herring fisheries is quite limited; however, herring were undoubtedly important as a food supply and source of groundfish bait (Scattergood and Tibbo, 1959).

The Passamaquoddy Region is now important as a sardine-producing area. Prior to the development of the sardine (immature herring) industry in the 1870's, the fishery was predominantly for large herring (Earll, 1887; Huntsman, 1953), which were used for salting, pickling, smoking, and bait. Now the fishery for large herring is of minor importance principally because the supply of mature fish in the region seems to have diminished during the last few years.

QUANTITIES LANDED

The most complete data collected on the herring fishery are those of the period 1947-58. Statistics of the Maine herring catch were not collected regularly prior to 1947. Furthermore, the pre-1947 statistics are not in detail that allows a separation of the catches into the Passamaquoddy high and low pool areas. Consequently, the pre-1947 statistics are not shown here.

During the 12-year period 1947-58, the Maine herring catch ranged from 75 million to 200 million pounds and averaged 148 million pounds (table 1, fig. 2). The value varied from $1,154,000 to $3,219,000, with an average of $2,109,000.

Table 1.--Maine herring landings 1947-58.[1]

Year	Volume	Value
	Thousand pounds	*Dollars*
1947	144,369	1,804,613
1948	168,514	3,218,617
1949	163,074	2,625,491
1950	199,640	1,357,552
1951	75,436	1,154,171
1952	175,780	2,126,938
1953	128,733	2,072,601
1954	141,281	2,020,318
1955	96,109	1,307,082
1956	147,406	2,417,458
1957	151,560	2,288,556
1958	178,235	2,673,525
Average	147,511	2,109,407

[1] From data collated by Bureau of Commercial Fisheries Biological Laboratory at Boothbay Harbor, Maine. There are slight differences between these figures and those published previously in the Fish and Wildlife Service's Statistical Digests.

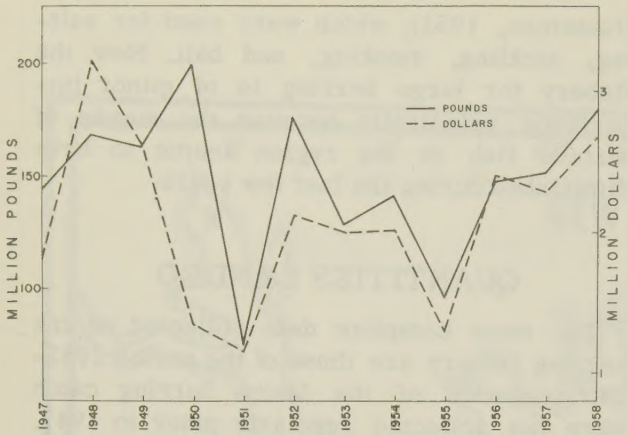


Figure 2.- Poundage and value of Maine herring landings 1947-58.

The Passamaquoddy Project area forms the eastern part of Washington County, for which herring statistics are also available. For convenience, we are considering that Washington County lies in herring statistical areas V, VI, VII, and VIII (fig. 3). Between 1947 and 1958, the Washington County catch ranged from 17,867,000 to 74,022,000 pounds, with an average of 40,746,000 pounds (table 2, fig. 4).

In the Passamaquoddy Project area, there have been marked fluctuations in the Maine herring catches in the high and low pools (table 3, fig. 5). The minimum and maximum landings for the 12-year period have been 237,000 and ~~6,150,000~~ 6,273 pounds in the high pool and 49,000 and 6,369,000 pounds in the low pool. Thus, in the high pool the maximum catch is 26

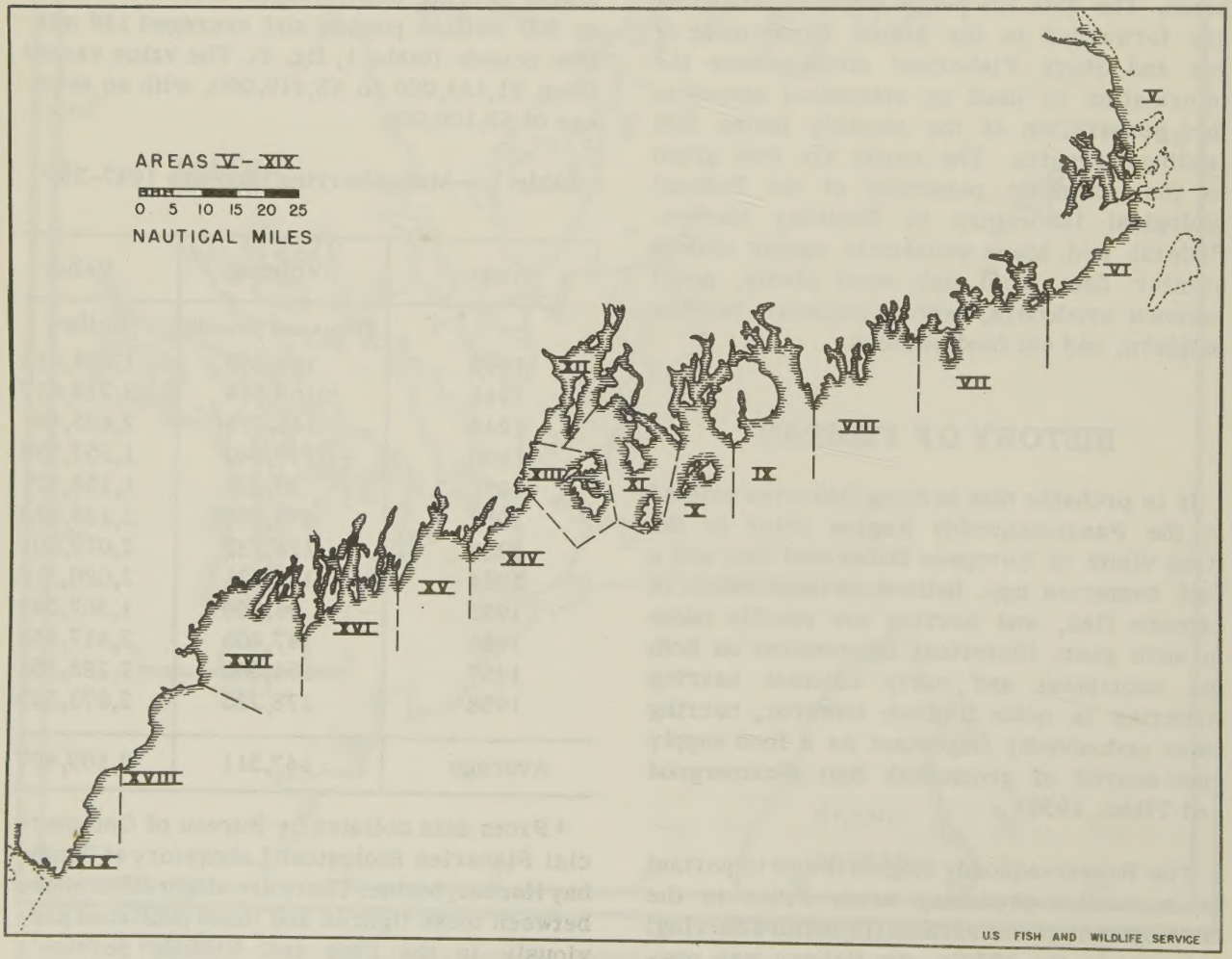


Figure 3.--Maine herring statistical areas (from Scattergood, 1949).

Table 2.--Washington County herring landings, 1947-58.

Year	Volume
	Thousand pounds
1947	48,492
1948	36,459
1949	71,237
1950	74,022
1951	24,575
1952	54,020
1953	27,234
1954	37,457
1955	17,867
1956	23,346
1957	37,329
1958	36,918
Average	40,746

Figure 4.--Maine herring landings in Washington County and Passamaquoddy Project area, 1947-58.

times the minimum, and in the low pool is 129 times the minimum. Combined total annual catches in both pools have averaged 6,490,000 pounds and have ranged from 2,004,000 pounds in 1958 to 10,858,000 pounds in 1953, which represents a fivefold difference between minimum and maximum. The average yearly catches were 3,613,000 pounds in the high pool and 2,878,000 in the low pool. The sizes of the landings from the two pools do not appear to be closely related, for example, in 1947 the low pool catch was 49,000 pounds, while the high pool had 6,273,000 pounds. In 1953, the catches were 4,569,000 and 3,949,000 pounds for the high and low pools, respectively. In 1954, the low pool had 6,369,000 pounds, but the high pool landings were only 238,000 pounds.

Annual landings in the Passamaquoddy Project area have represented 1.1 to 12.1 percent (average 4.4 percent) of the total Maine catch and 5.4 to 39.9 percent (average 15.9 percent) of the Washington County catch.

In the Maine area immediately outside the pools (area VI in fig. 3), the catches have varied between 1,566,000 and 17,838,000 pounds, and an elevenfold difference.

Figures 6-11 show graphically the distribution of yearly catches in the Passamaquoddy Project area and the Maine coast as far southwest as Cutler Harbor.

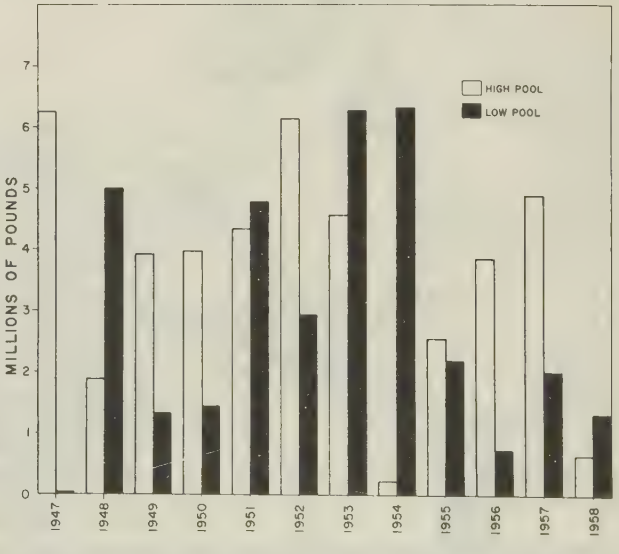
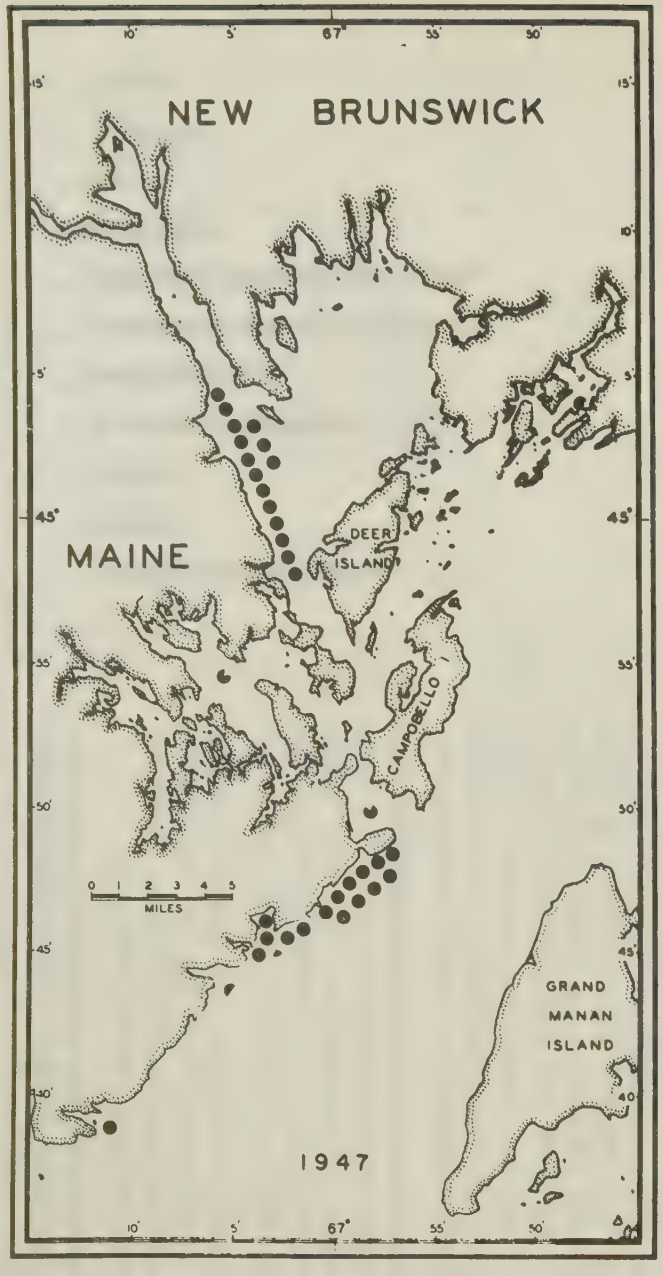


Figure 5.--Maine herring landings in high and low pools, 1947-58.



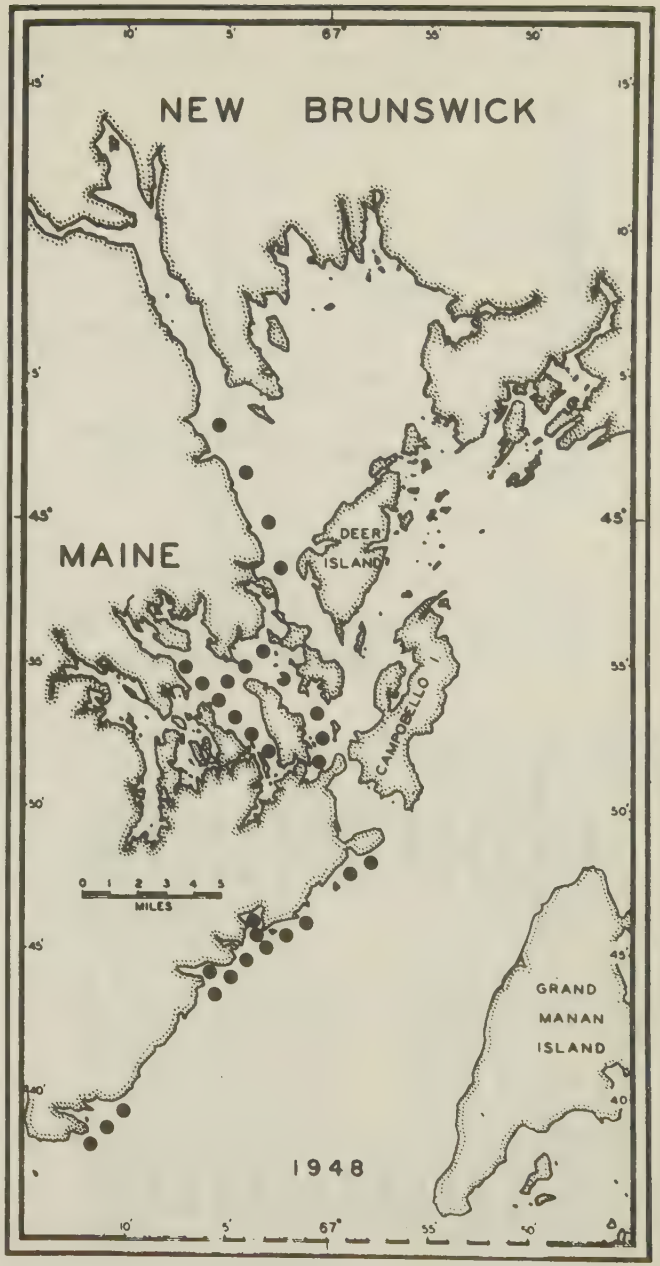
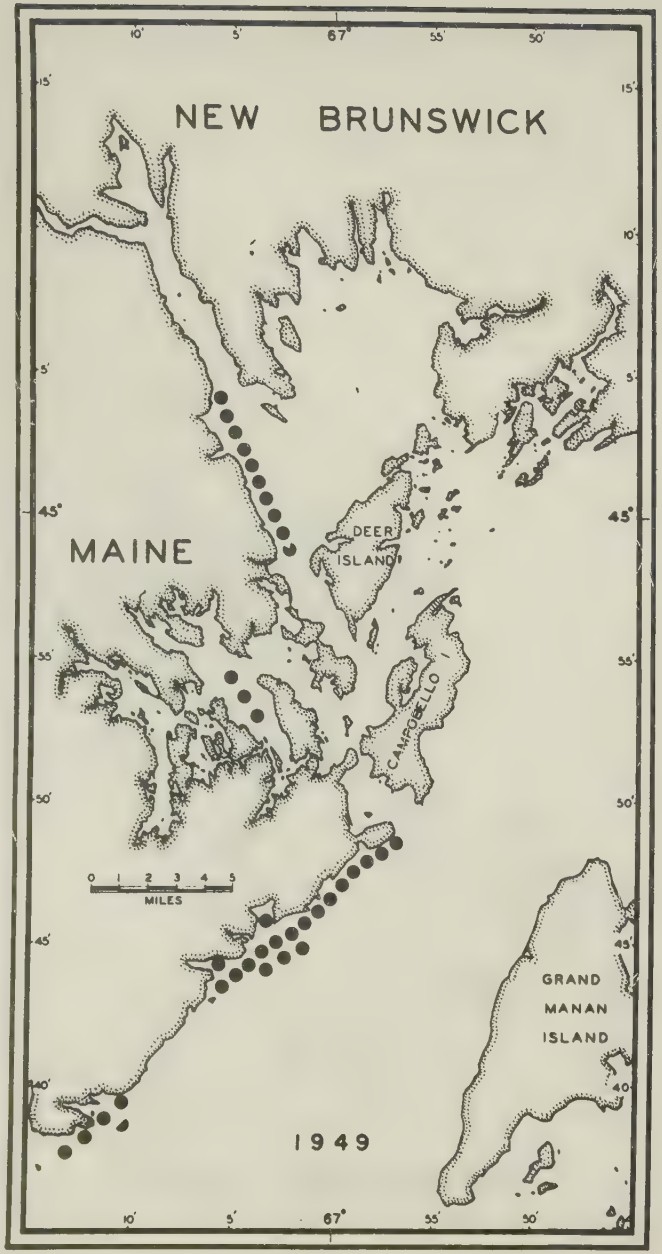


Figure 6.--Distribution of herring catches in 1947 and 1948. Each dot represents 200 tons.



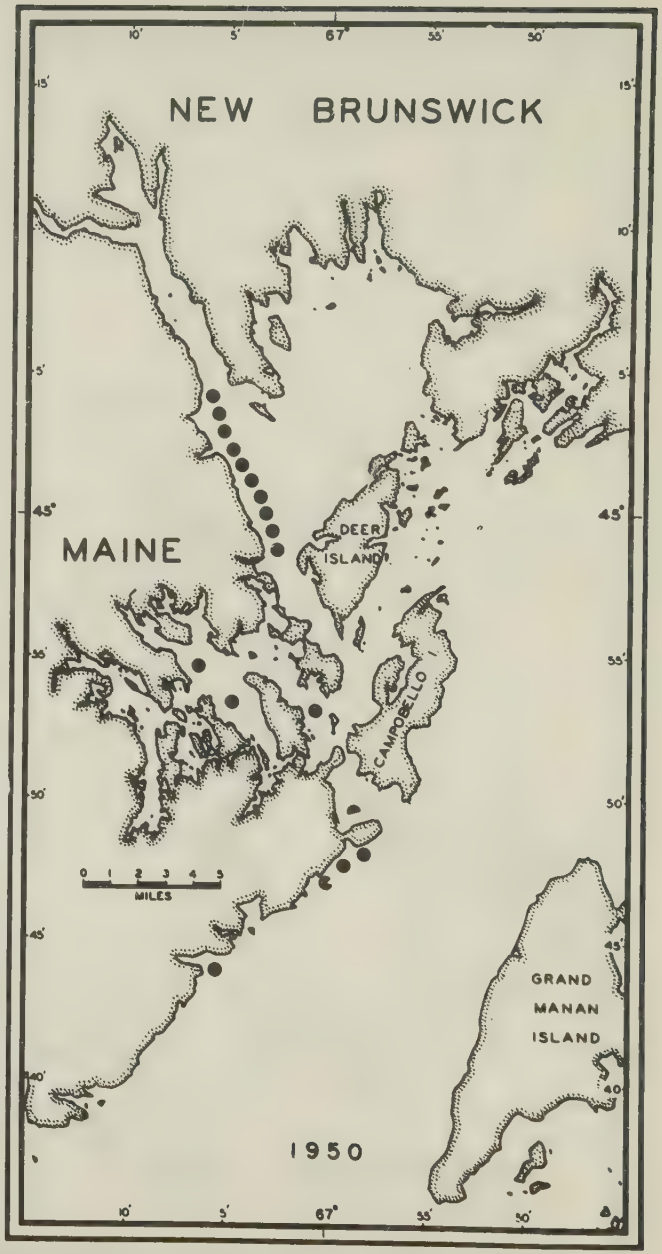
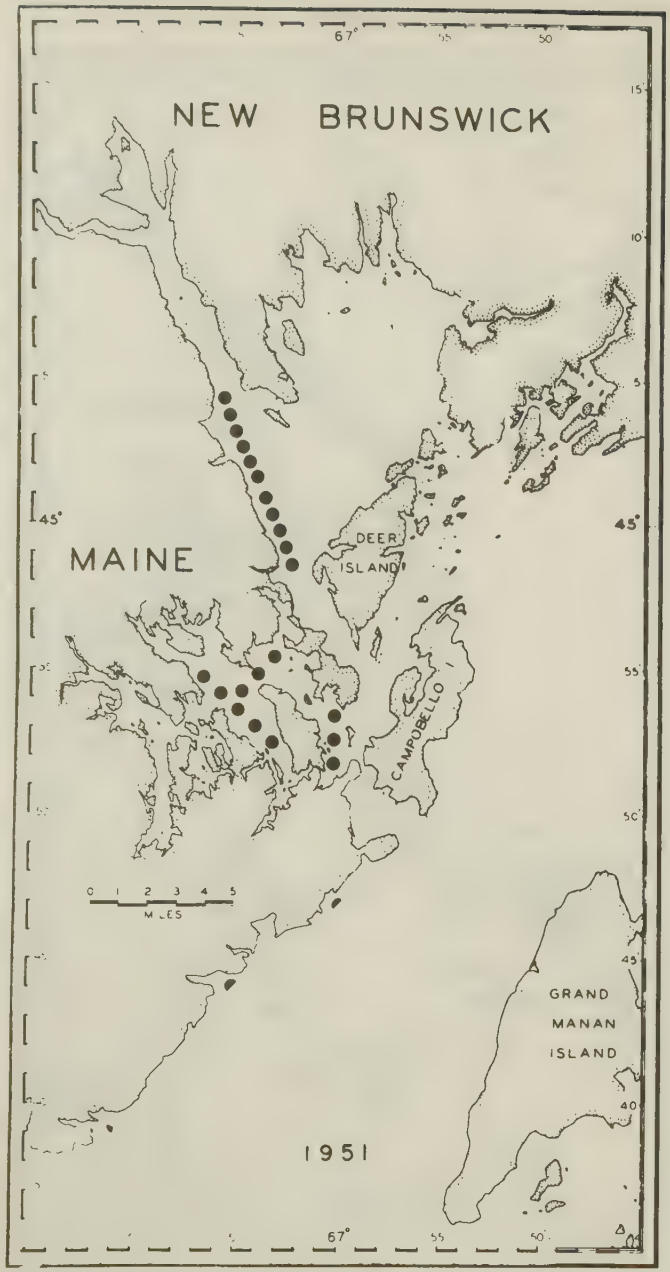


Figure 7.--Distribution of herring catches in 1949 and 1950. Each dot represents 200 tons.



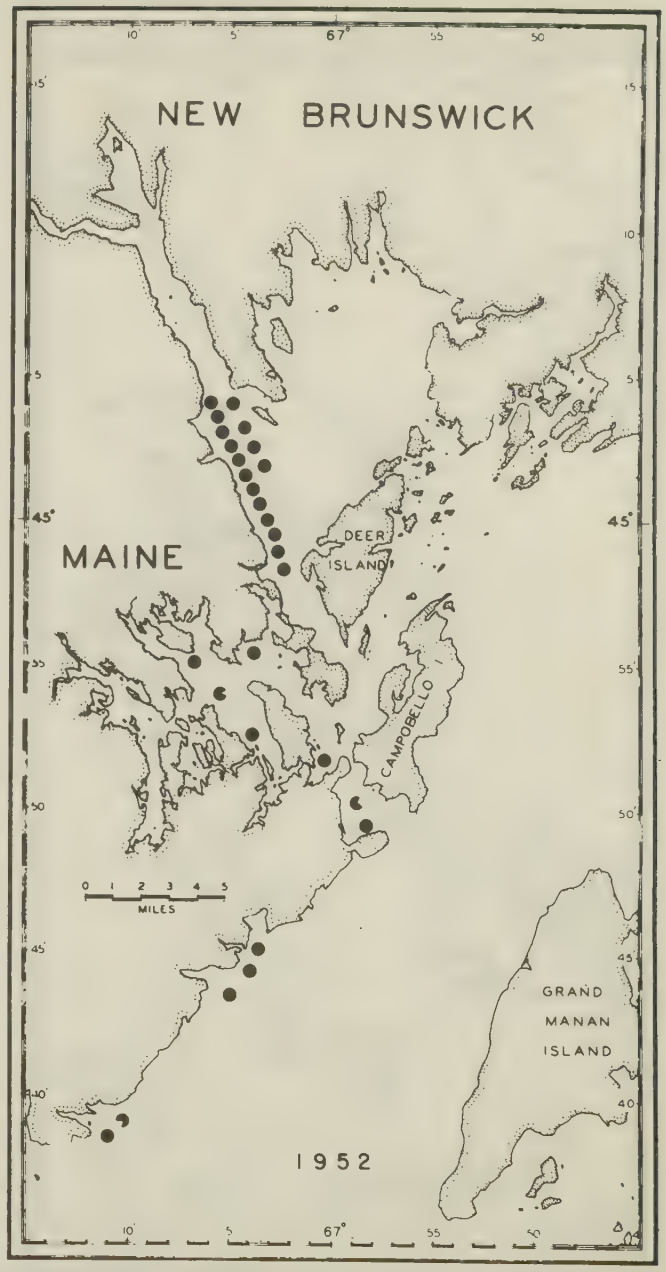
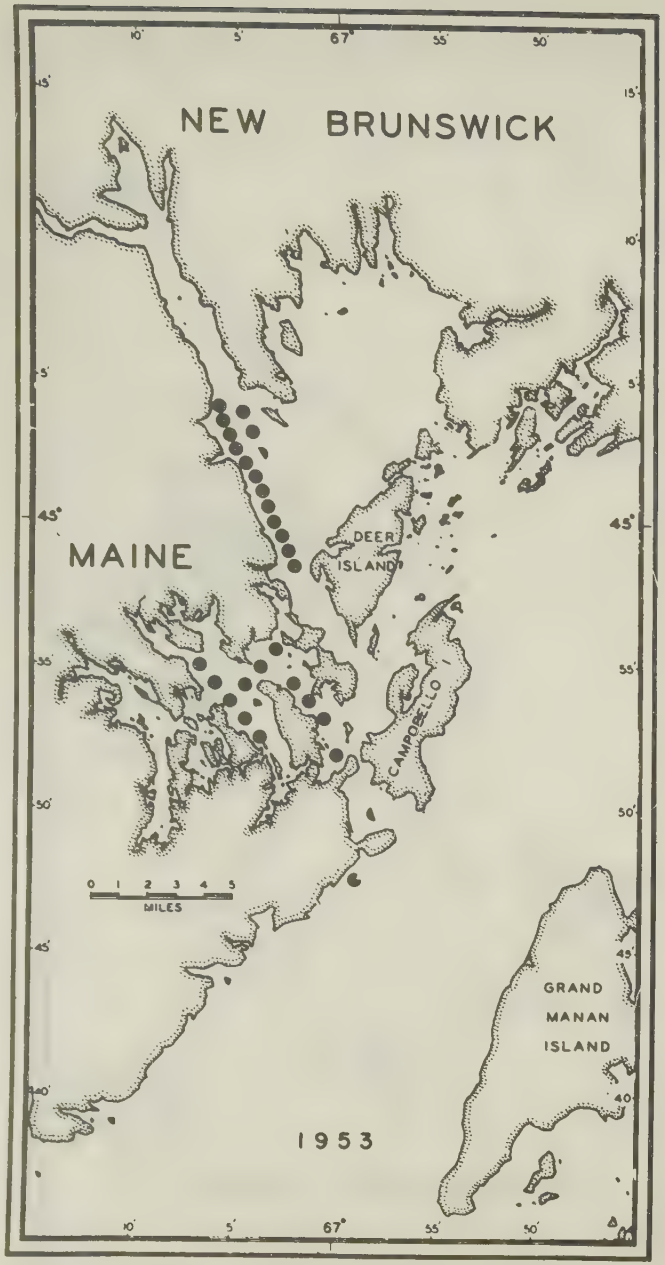


Figure 8.--Distribution of herring catches in 1951 and 1952. Each dot represents 200 tons.



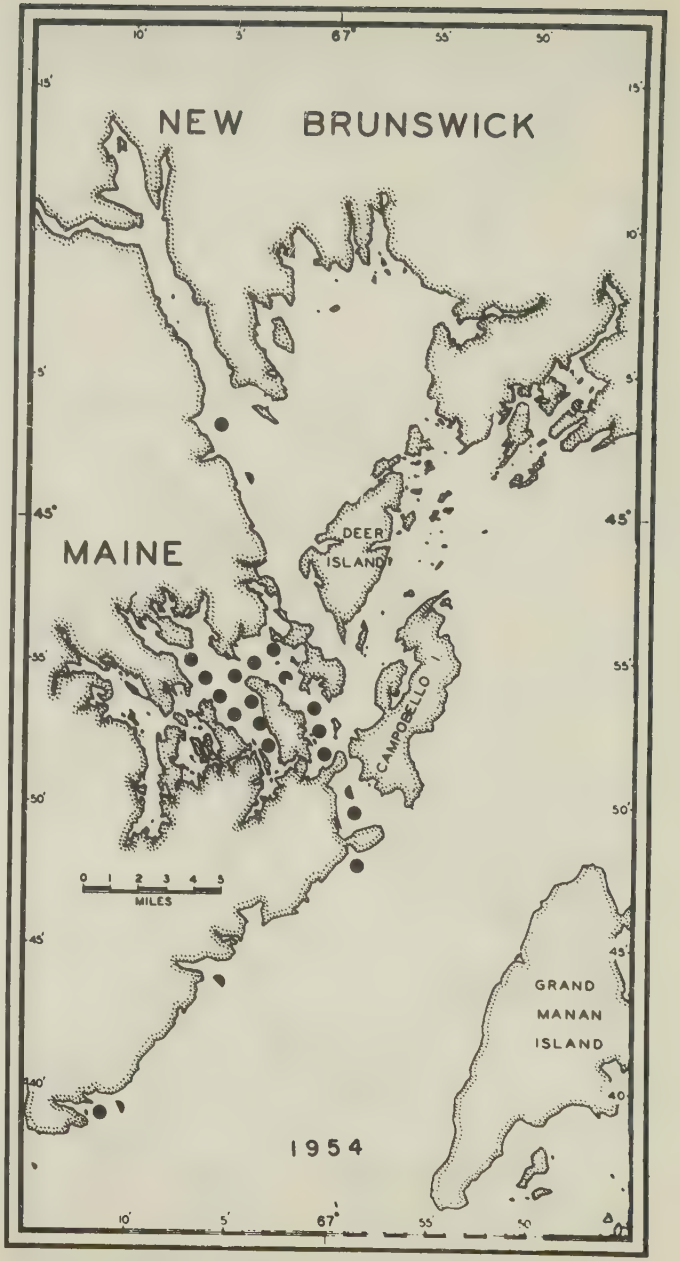
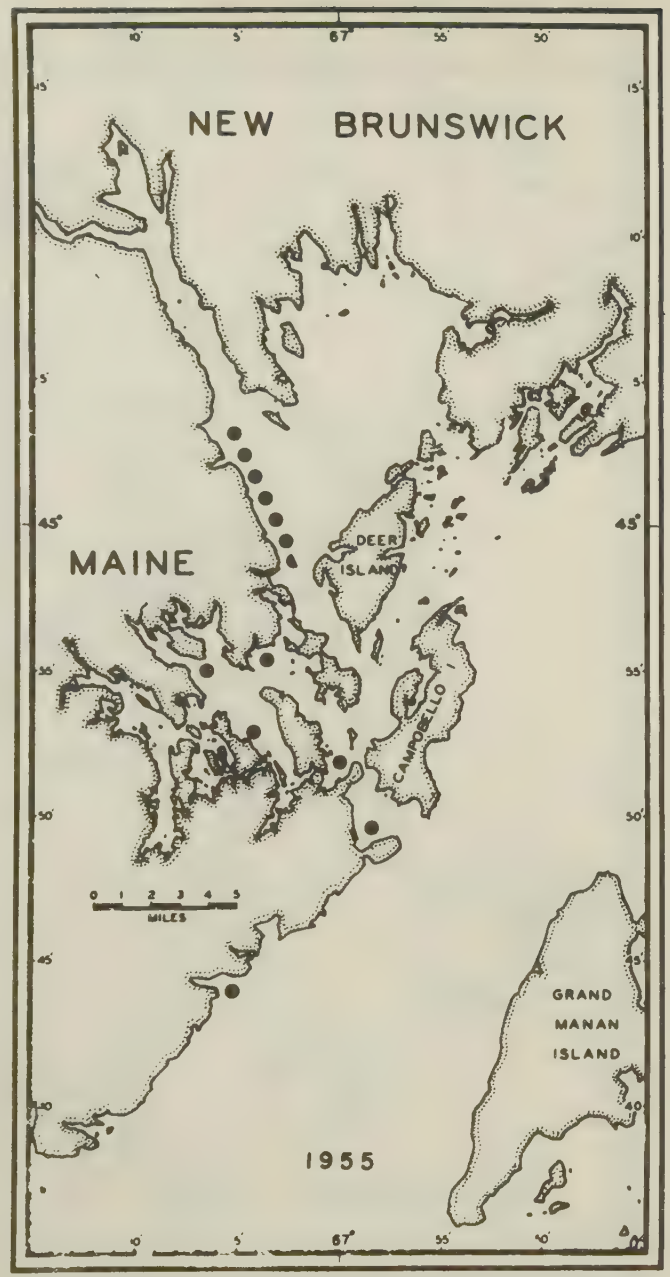


Figure 9.--Distribution of herring catches in 1953 and 1954. Each dot represents 200 tons.



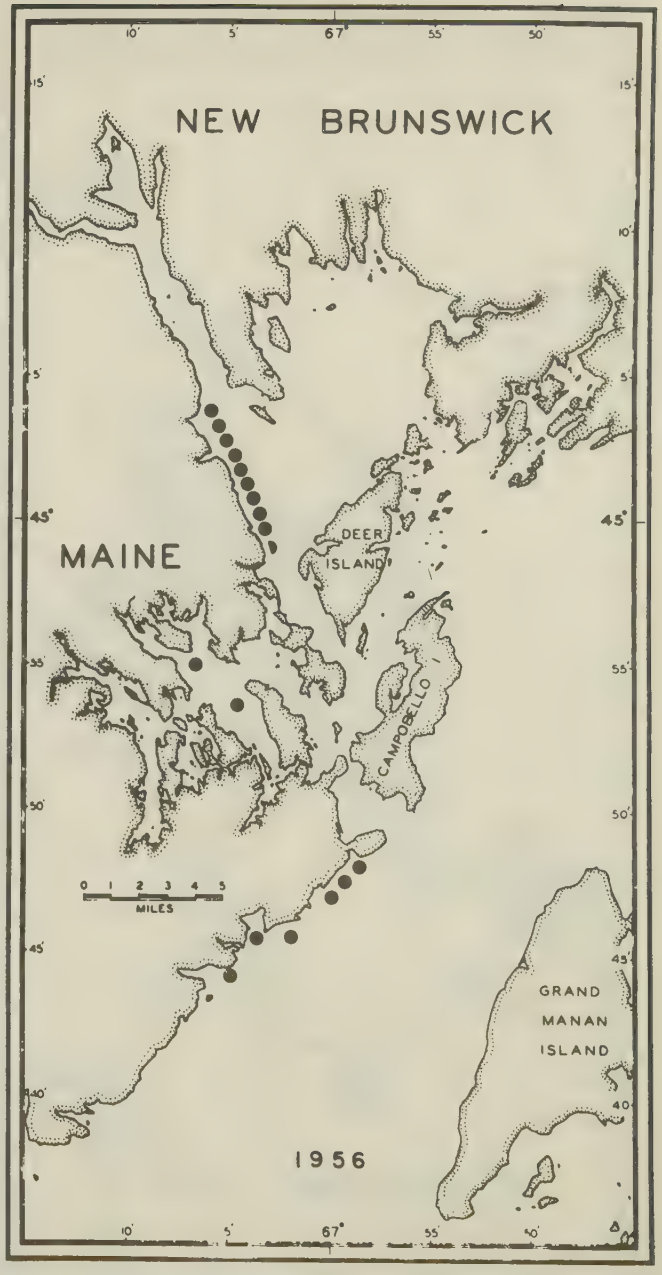
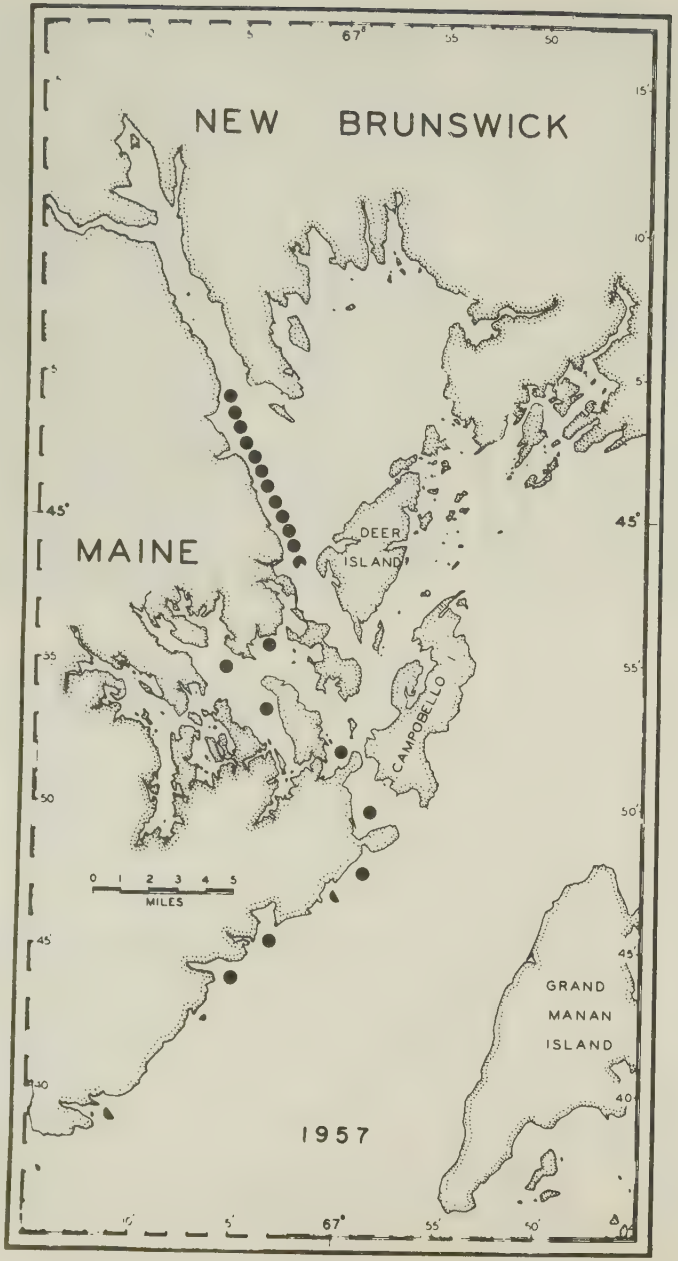


Figure 10.--Distribution of herring catches in 1955 and 1956. Each dot represents 200 tons.



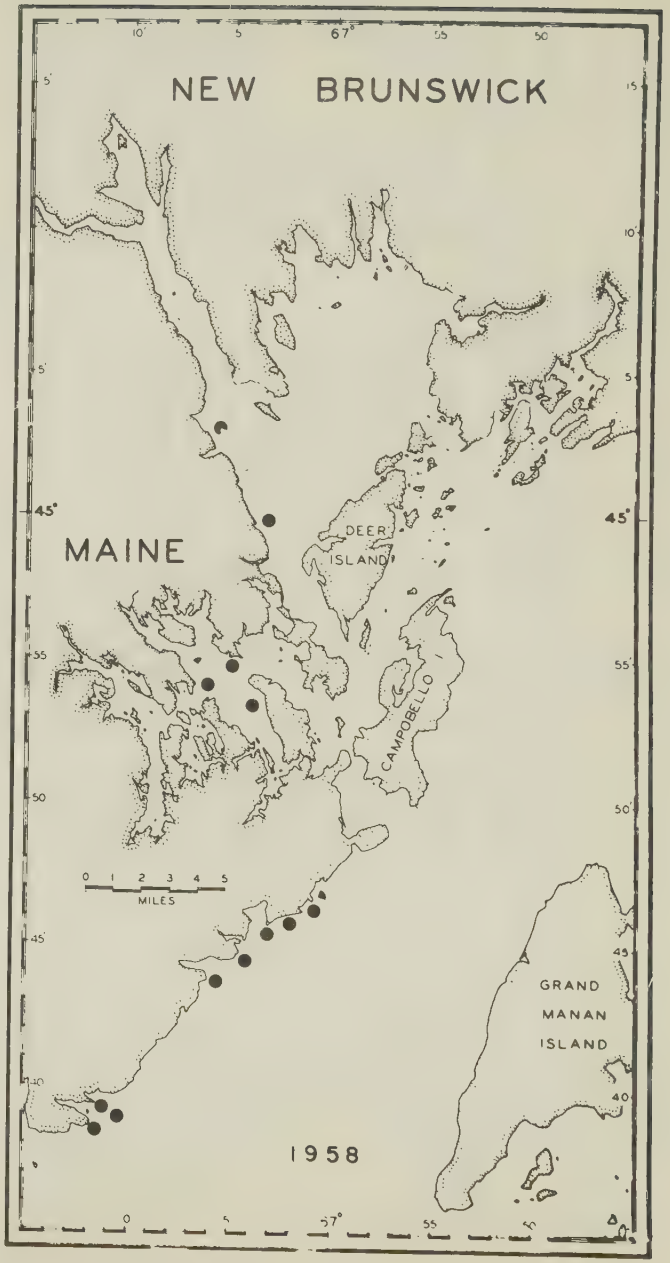


Figure 11.--Distribution of herring catches in 1957 and 1958. Each dot represents 200 tons.

Table 3.--Herring landings from Passamaquoddy Project area and adjacent region.[1]

[In pounds]

Year	Passamaquoddy Project area			Adjacent region
	Low pool	High pool	Total pools	
1947	49,000	6,273,225	6,322,225	15,147,988
1948	5,043,325	1,896,300	6,939,625	8,269,490
1949	1,342,600	3,916,325	5,258,925	17,837,930
1950	1,455,300	3,972,675	5,427,975	5,191,914
1951	4,778,725	4,340,175	9,118,900	2,203,370
1952	2,940,000	6,149,500	9,089,500	3,645,728
1953	6,289,150	4,569,250	10,858,400	2,025,987
1954	6,368,775	237,650	6,606,425	3,360,248
1955	2,136,400	2,559,025	4,695,425	1,565,971
1956	755,825	3,869,775	4,625,600	4,593,848
1957	2,026,150	4,906,125	6,932,275	2,896,311
1958	1,343,825	660,275	2,004,100	6,713,215
Average	2,877,423	3,612,525	6,489,948	6,121,000

[1] The adjacent region includes area VI in figure 3.

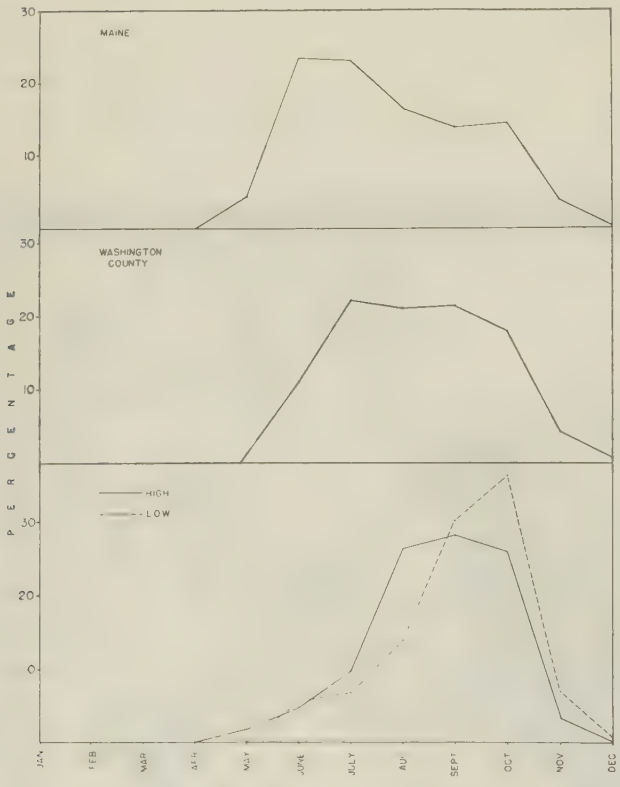


Figure 12.--Herring catches by months, 1947-58, for Maine, Washington County, and Passamaquoddy Project high and low pools.

SEASONS

The fishery for Maine herring is a seasonal operation. There are several reasons why most of the landings occur during the summer and autumn months. First, the fish are not readily available to the present fishery during the winter and spring months. Second, there is a Maine State law that prohibits the canning of sardines between December 1 and April 15. Third, sardine packers often stop canning in the autumn if they have packed enough to fill the anticipated demand.

The bulk of the herring catches have been made between June and October (table 4, fig. 12) when over 90 percent of the herring have been landed. A comparison of the monthly herring catches in all of Maine, in Washington County, and in the low and high pools indicates that the peak months have varied within the 5-month period of greatest activity. June and July have been the principal months for the total Maine catch. In Washington County, July, August, and September have been the peak months. In the low pool, September and October landings have been dominant; while in the high pool, August, September, and October catches have been about equally important.

Table 4.--Herring catches by months, 1947-58.

[In percentage]

Month	Maine	Washington County	Low pool	High pool
January	0.0	---	---	---
February	---	---	---	---
March	0.0	0.0	---	---
April	0.1	0.0	---	0.1
May	4.4	1.2	0.1	1.8
June	23.3	11.1	5.5	4.7
July	23.0	22.2	6.7	9.6
August	16.5	21.2	13.8	26.3
September	13.9	21.4	30.1	28.1
October	14.4	18.0	36.2	25.9
November	3.9	4.2	6.9	3.3
December	0.4	0.7	0.7	0.2
Date unknown	0.1	---	---	---

GEAR

The Maine herring fishery employs three principal types of gear; weir, stop seine, and purse seine. Scattergood and Tibbo (1959) provide information on the history and uses of these gears. Gill nets, which once were important gears for catching large herring, are now seldom used. The otter trawl has never been a herring-fishing gear in Maine. A State law prohibits its use in Washington County; in other counties it can be employed legally, but such a fishery has never been profitable.

During 1947-58, about three-quarters of the Maine herring catches were made by stop seiners (table 5). The weirs were next in importance, being responsible for a little less than one-quarter of the herring catch. Purse seines account for only a little more than one percent. Stop seines are particularly important along the western and central coast areas.

In Washington County, weirs are intensively used. Table 6 shows the number of weirs in operation in all Maine, Washington County, and the high and low pools. Figures 13-16 show the geographical distribution of the weirs in Washington County, which during the 12-year period has had 63 percent of the Maine weirs.

Weirmen have produced most of the Washington County herring catch (table 7), having been responsible for 58 percent of the herring catch in that county during 1947-58. Stop seiners caught 41 percent. The seiners are becoming increasingly important in the region and in some recent years have caught more fish than the weirmen. Legal restrictions against the use of seines near weirs have tended to reduce the efficiency of seiners in Washington County.

In the Passamaquoddy Project area, weirs and seines are the principal gears. Purse seines have been seldom used by Maine Passamaquoddy fishermen, although Canadian purse seiners have been quite successful in recent years. The number of weirs in the low pool has averaged 6, ranging between none and 16, and in the high pool has averaged 16, with a range of 14 to 31 (table 5, fig. 17).

In the low and high pools, the relative importance of the two gears varied (table 8, fig. 18). In the low pool, the stop seine has been dominant and has been responsible for about three-quarters of the catch. The weir catch of the high pool has been more important, accounting for over 80 percent of the catch.

Table 5.--Maine herring landings by gear, 1947-58.

[In percentage]

Year	Weir	Stop seine	Purse seine	Unknown
1947	30.1	64.3	5.1	0.5
1948	27.2	70.7	1.6	0.5
1949	41.7	58.2	0.1	---
1950	32.9	66.2	0.5	0.4
1951	26.9	71.3	1.4	0.4
1952	21.5	76.1	2.2	0.2
1953	18.4	78.4	2.2	1.0
1954	18.7	80.3	0.9	0.1
1955	16.7	83.0	0.1	0.2
1956	12.7	86.6	0.7	---
1957	16.3	82.6	1.1	---
1958	11.4	88.1	0.2	0.3
Average	23.0	75.4	1.3	0.3

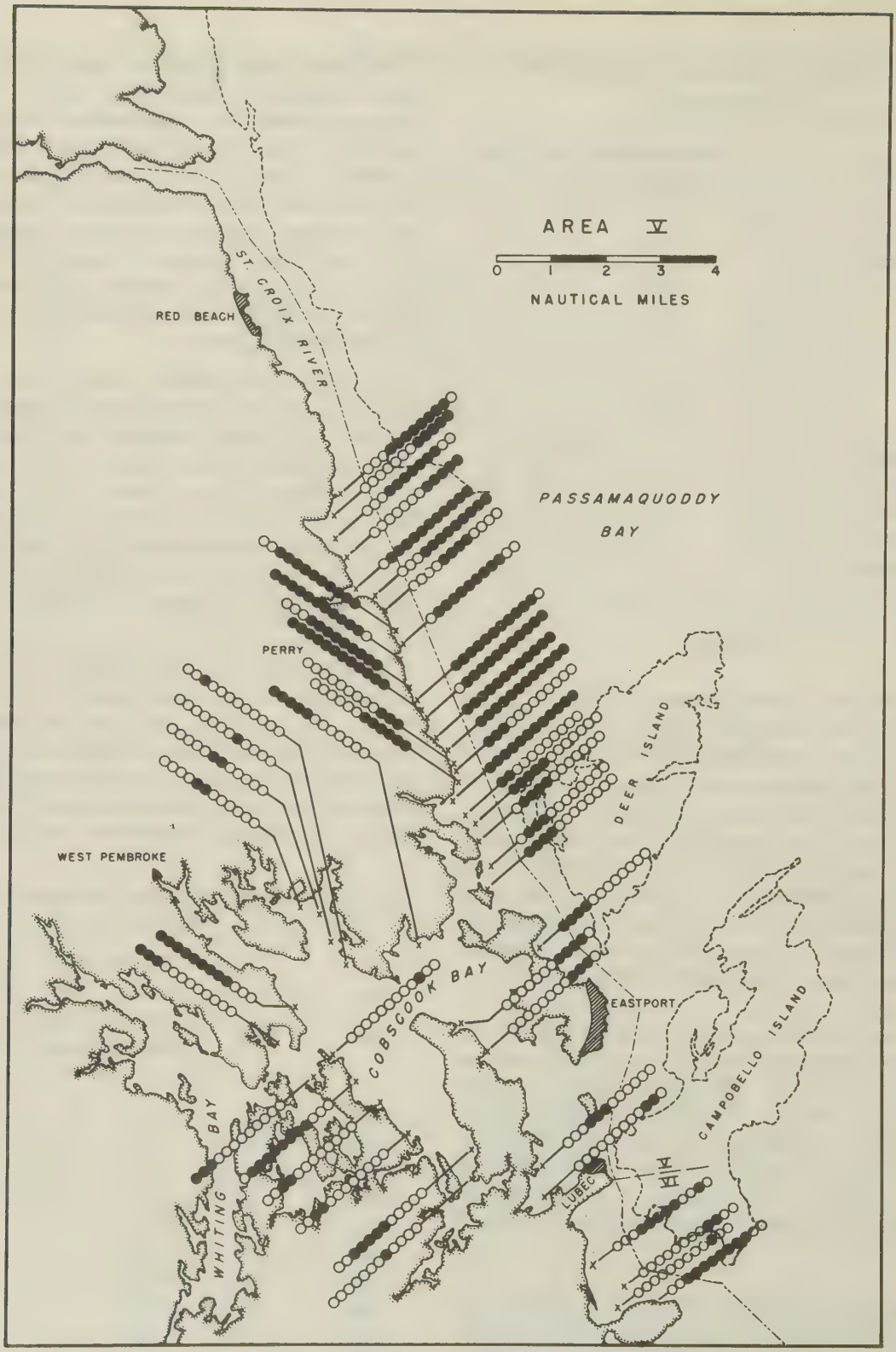


Figure 13.--Weirs in Maine statistical area V and part of VI. A black dot indicates that the weir was operating; a circle indicates that it was not operating. Each circle or dot represents a single year; the year 1947 is nearest the weir locations, and 1958 is at the extremity of the row.

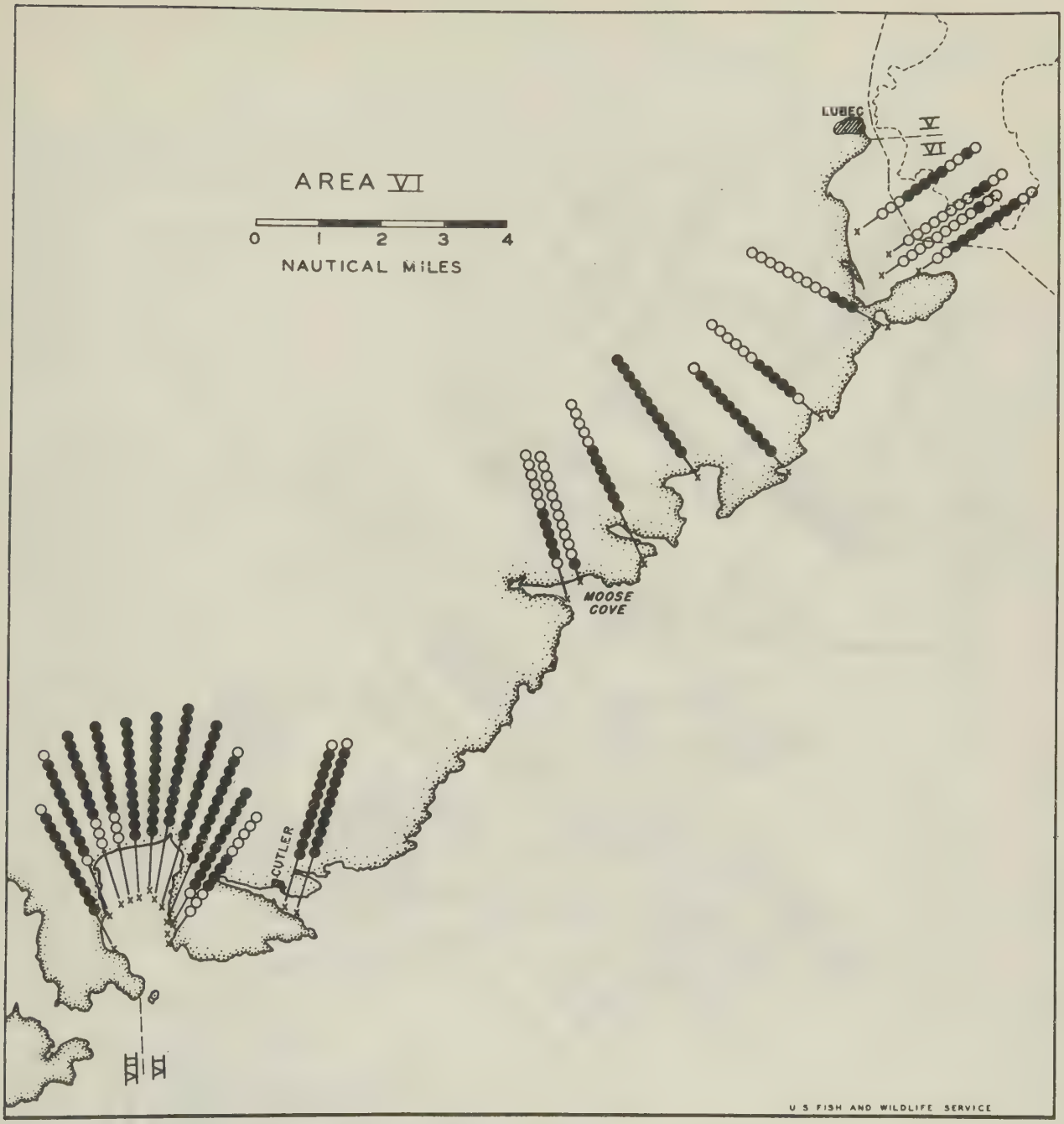


Figure 14.--Weirs in Maine statistical area VI. A black dot indicates that the weir was operating; a circle indicates that it was not operating. Each circle or dot represents a single year; the year 1947 is nearest the weir location, and 1958 is at the extremity of the row.

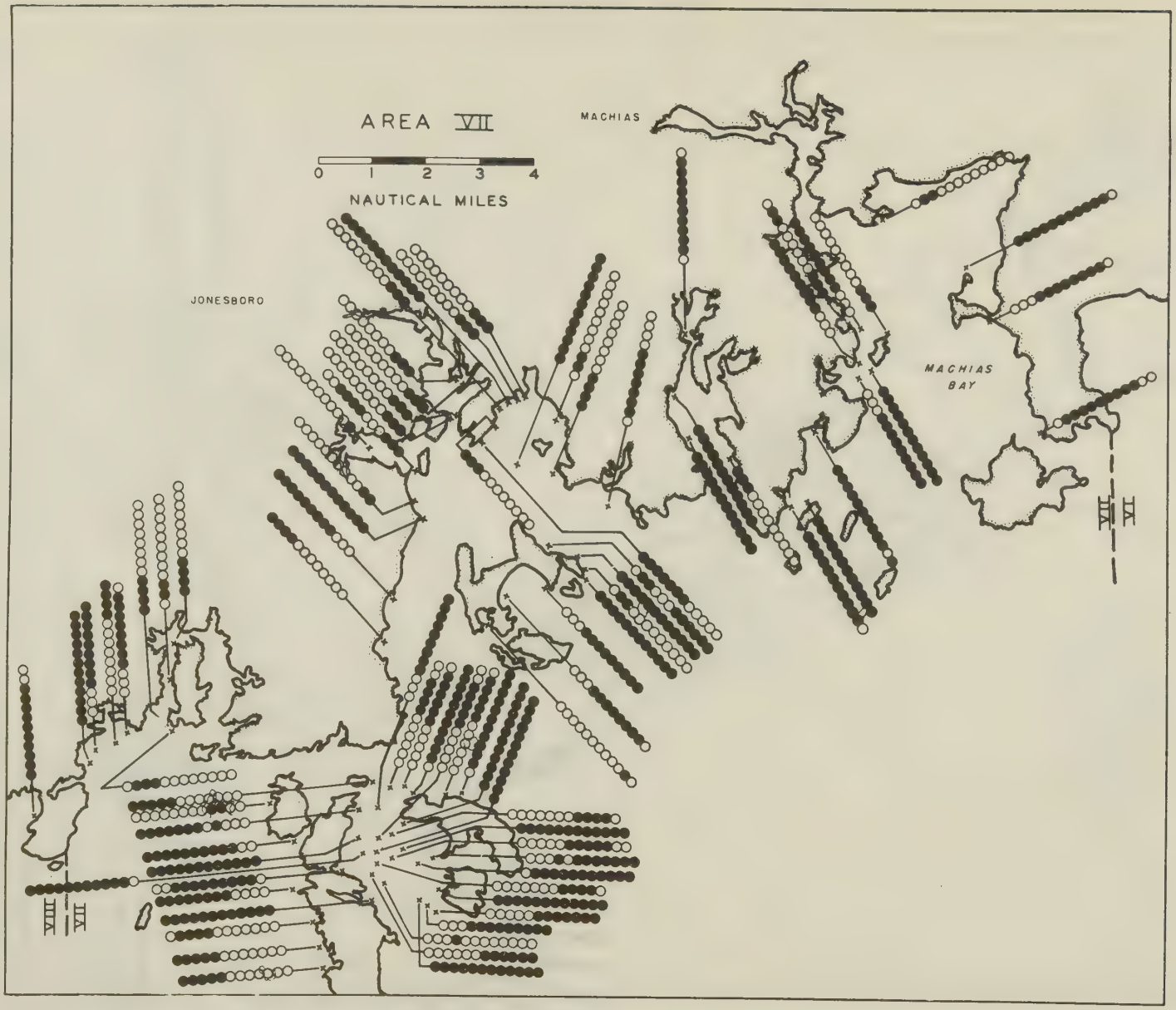


Figure 15.--Weirs in Maine statistical area VII. A black dot indicates that the weir was operating; a circle indicates that it was not operating. Each circle or dot represents a single year; the year 1947 is nearest the weir location, and 1958 is at the extremity of the row.

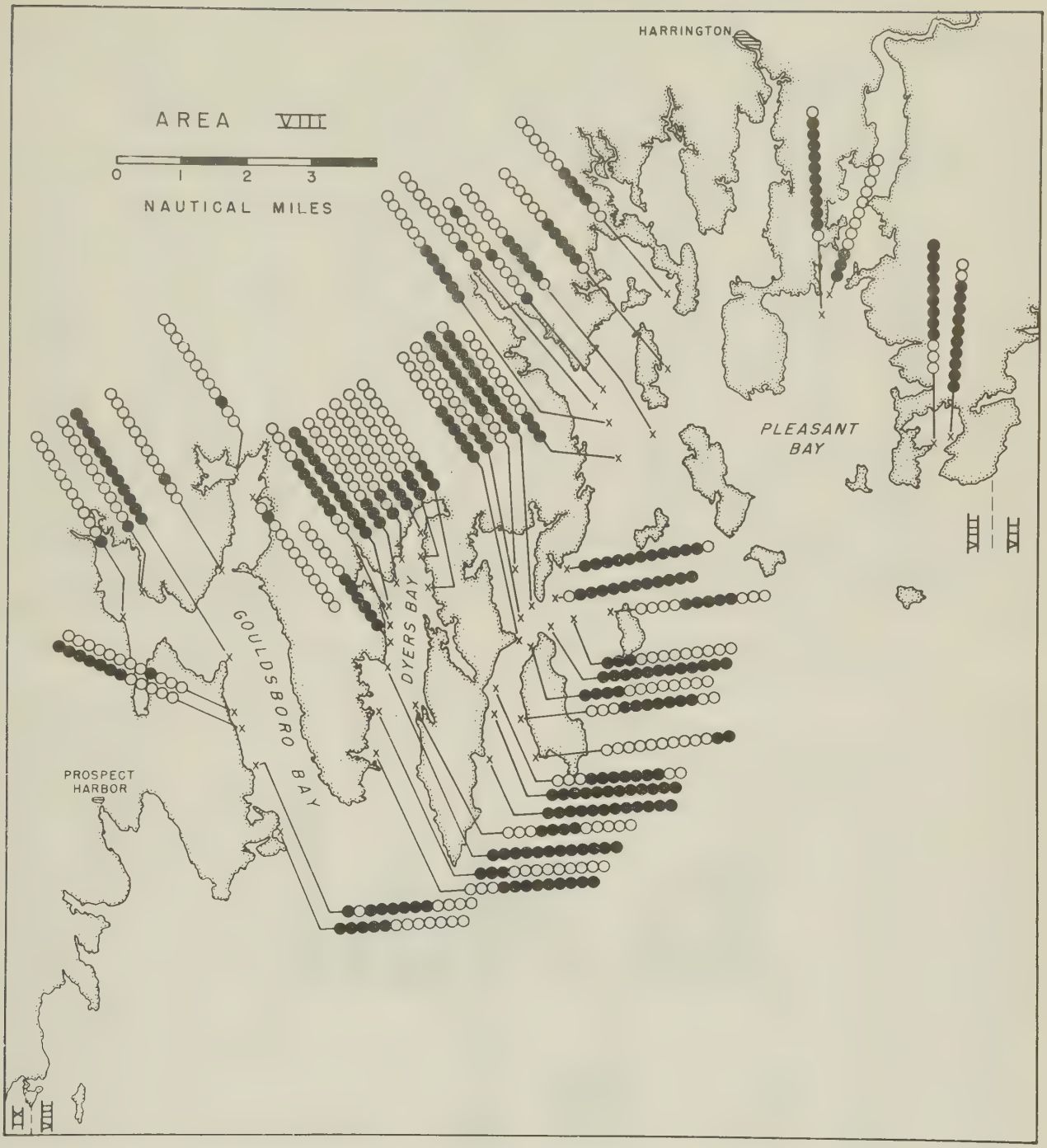


Figure 16.--Weirs in Maine statistical area VIII. A black dot indicates that the weir was operating; a circle indicates that it was not operating. Each circle or dot represents a single year; the year 1947 is nearest the weir location, and 1958 is at the extremity of the row.

Table 6.--Number of weirs in operation, 1947-58.

Year	Washington County					Total Maine
	High pool	Low pool[1]	Area VI	Area VII	Area VIII	
1947	14	0	13	37	30	148
1948	20	0	16	49	27	177
1949	19	1	18	51	35	220
1950	20	5	20	51	28	192
1951	18	7	20	43	27	177
1952	16	7	20	48	28	186
1953	15	7	18	53	21	177
1954	17	8	16	58	20	182
1955	16	10	16	60	18	188
1956	15	16	16	60	17	189
1957	12	9	15	55	16	164
1958	10	4	7	42	12	124
Average	16	6	16	51	23	177

[1]Includes small part of area VI between Lubec and West Quoddy Head.

Table 7.--Washington County herring landings by gear, 1947-58.
[In percentage]

Year	Weir	Stop seine	Unknown[1]
1947	73.0	27.0	---
1948	64.6	35.4	---
1949	73.5	26.5	---
1950	58.2	41.2	0.6
1951	63.8	34.9	1.3
1952	47.3	52.2	0.5
1953	58.6	36.6	4.8
1954	47.0	53.0	---
1955	59.3	39.9	0.8
1956	55.5	44.5	---
1957	43.5	56.5	---
1958	48.9	49.5	1.6
Average	58.4	40.9	0.7

[1]These catches could not be assigned to any particular gear, but undoubtedly they were caught by either weir or stop seine.

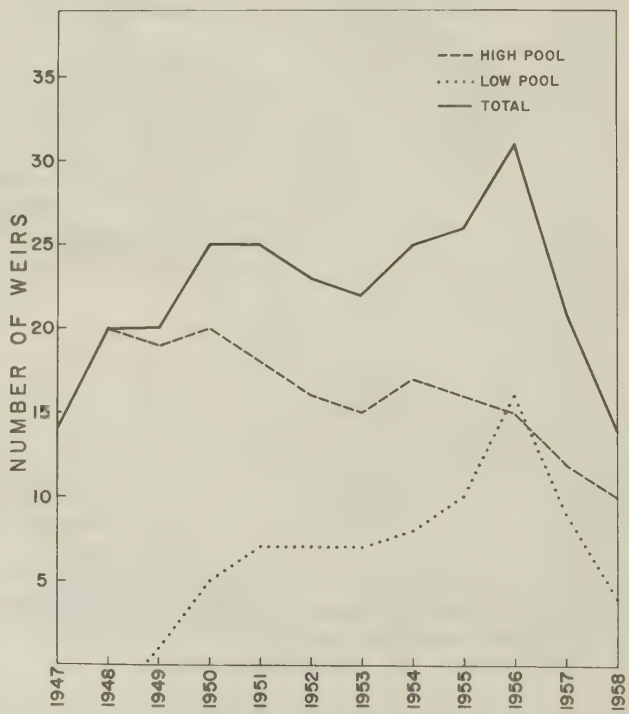


Figure 17.--Weirs in operation in high and low pools, 1947-58.

Table 8.--Passamaquoddy Project area herring landings by gear, 1947-58.

[In percentage]

Year	Low pool			High pool		
	Weir	Stop seine	Unknown[1]	Weir	Stop seine	Unknown
1947	---	100.0	---	87.8	12.2	---
1948	---	100.0	---	97.2	2.8	---
1949	10.6	89.4	---	97.9	2.1	---
1950	2.3	71.5	26.2	70.0	29.0	0.1
1951	17.9	76.1	6.0	90.7	9.3	0.0
1952	34.3	61.3	4.4	59.7	38.0	2.3
1953	14.4	69.2	16.4	86.4	11.9	1.7
1954	34.9	65.1	---	100.0	---	---
1955	37.5	62.5	---	85.4	9.5	5.1
1956	39.4	60.6	---	92.6	7.4	---
1957	36.4	63.6	---	67.5	32.5	---
1958	16.1	83.9	---	100.0	---	---
Average	20.9	73.8	5.3	81.9	17.2	0.9

[1]These catches could not be assigned to any particular gear, but were undoubtedly caught by either weir or stop seine.

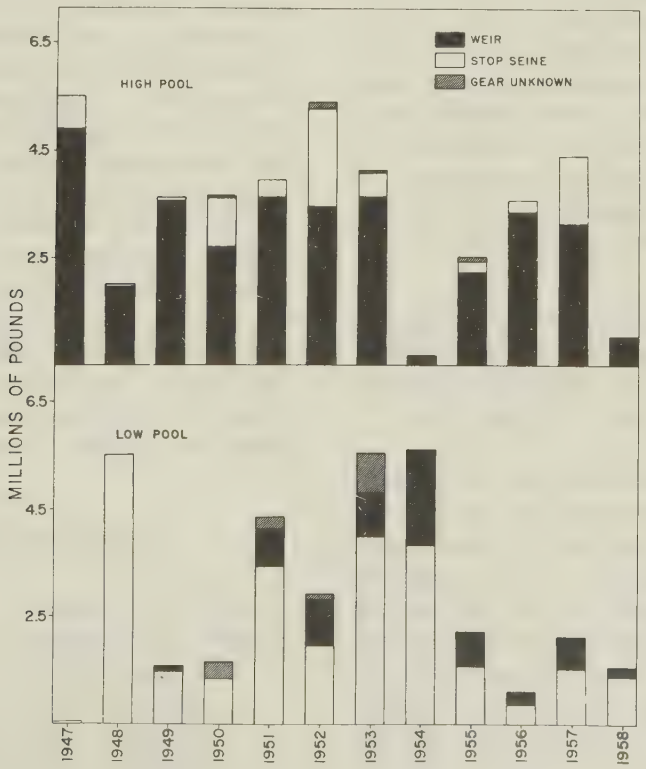


Figure 18.- Herring landings by gear in high and low pools, 1947-58.

SUMMARY

1. The proposed Passamaquoddy Project would form two impounded areas--the high and low pools, both now important as herring-fishing areas.

2. A statistical system established in 1947 has provided figures on the quantity of herring caught, the date and locality of capture, and gear used.

3. The Passamaquoddy Project area is important as a sardine-producing area. Few large fish are now caught and their abundance is apparently low in the region.

4. The landings of the Maine herring fishery during 1947-58 have averaged 148 million pounds and have ranged from 75 to 200 million pounds. The average value of the catch has been over 2 million dollars. The Washington County catch has averaged about 41 million pounds and has ranged from 18 to 74 million pounds. The Passamaquoddy Project high and low pools, which are part of Washington County, have averaged 6 million pounds with a range of 2 to almost 11 million pounds. Herring landings immediately outside the Project area (West Quoddy Head to Cross Island) averaged 6 million pounds with a range of 2 to 18 million pounds. From the variation in the catches, it is apparent that the differences between years are manyfold.

5. Annual herring landings in the Passamaquoddy Project area have been between 1 and 12 percent of the total Maine herring catch, with an average of 4.4 percent.

6. Comparison of yearly catches in the high and low pools indicates that they have fluctuated widely. In 1947, there were 49,000 pounds taken in the low pool and over 6 million pounds, in the high pool. In 1954, the low pool catch was over 6 million pounds, and the high pool was 200,000 pounds. In 1953, the catches were not so greatly different, being about 4½ million for the high pool and 4½ million for the low pool.

7. The Maine herring fishery is seasonal; over 90 percent of Maine, Washington County, and Passamaquoddy Project landings have been made in June to October. The low pool landings have been principally in September and October, and the high pool in August to October.

8. Stop seines have been the most productive herring-fishing gear in all Maine and have taken about three-quarters of the catch. In Washington County, however, weirs have taken slightly more herring than stop seines. In the low pool, stop seines have caught about three-quarters of the herring; and, in the high pool, weirs have taken over 80 percent.

9. The number of weirs has varied from none to 16 in the low pools and 14 to 31 in the high pool. The Washington County weirs have represented over 60 percent of the total Maine weirs.

ACKNOWLEDGMENTS

Information on the statistics of the herring fishery has been contributed by the personnel of several organizations. The fish inspectors of the Division of Inspection of the Maine Department of Agriculture supplied the basic data on herring landings at sardine factories; two statistical agents, Louis Cates of the Maine Department of Sea and Shore Fisheries, and D. Arthur McKown of the U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, assisted in the collection of further information on landings; and John P. Wentworth of the Bureau of Commercial Fisheries Biological Laboratory at Boothbay Harbor, Maine, obtained statistics from herring buyers other than sardine canners.

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